



NOTES

PARAMYXOVIRUSES

MICROBE OVERVIEW

- **Paramyxoviruses:** negative-sense single-stranded RNA virus family
- **Natural hosts:** humans, vertebrates, birds
- **Replication:** occurs in cytoplasm; exits by budding
- **Transmission:** air borne particles
- **Viral structure:** enveloped, linear genomes, spherical/pleomorphic
- **Pathogenic paramyxoviruses:** human parainfluenza virus (HPIV), measles, mumps, respiratory syncytial virus (RSV)

HUMAN PARAINFLUENZA VIRUSES (HPIV)

osms.it/human-parainfluenza-viruses

PATHOLOGY & CAUSES

- **Croup (laryngotracheobronchitis):** infection usually caused by HPIV
- Four distinct HPIV serotypes
 - HPIV-1: croup
 - HPIV-2: croup; upper, lower respiratory tract illnesses
 - HPIV-3: bronchiolitis, pneumonia
 - HPIV-4: infrequently detected
- Common respiratory distress cause (children)
- Viral infection → infiltration of histiocytes, lymphocytes, other white blood cells → airway inflammation, edema → upper-airway obstruction → ↑ breathing work, barking cough, inspiratory stridor (turbulent, noisy airflow), vocal hoarseness

RISK FACTORS

- Age
 - Six months to three years

- Biologically-male to biologically-female ratio of 1.4:1
- Previous intubation
- Hyperactive airways
- Congenital airway narrowing
- Late autumn (peak case onset)

COMPLICATIONS

- Respiratory failure
- Bacterial superinfection
 - Pneumonia, bacterial tracheitis

SIGNS & SYMPTOMS

- Prodrome
 - Upper respiratory tract infection symptoms (coryza, cough, mild fever)
- Acute onset: "barking" cough
- Inspiratory stridor; biphasic stridor (severe obstruction sign)
- Hoarseness

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- Respiratory distress, ↑ breathing work (e.g. suprasternal, intercostal, subcostal retractions)
- Agitation
- Symptoms worse at night
- Asynchronous chest movement
- Severe: fatigue, hypoxia, hypercarbia

DIAGNOSIS

OTHER DIAGNOSTICS

Westley score

- Severity classification
- Calculated on five factors
 - Level of consciousness, cyanosis, stridor, air entry, retractions
 - Score between 0–17 classifies case as mild, moderate, severe croup; impending respiratory failure

TREATMENT

MEDICATIONS

- Corticosteroids; dexamethasone for anti-inflammatory effects
- Nebulized epinephrine in moderate, severe croup; temporary airway obstruction relief

OTHER INTERVENTIONS

- Provide comfort, avoid child's further distress

MEASLES VIRUS

osms.it/measles

PATHOLOGY & CAUSES

- A paramyxovirus that causes measles, a highly infectious illness
 - Fever, cough, coryza, conjunctivitis, followed by exanthem
- Transmitted via person-to-person contact, droplets → infects upper respiratory tract epithelial cells

Clinical stages (four)

- Incubation
 - 6–21 days
 - Virus infects respiratory mucosa/conjunctiva → local replication → lymphatic tissue spread → disseminates via blood circulation → first viremia (infection of endothelial, epithelial, monocyte, macrophage cells)
 - Usually asymptomatic
- Prodrome
 - 2–4 days

- Onset of fever, malaise, anorexia, conjunctivitis, coryza, cough
- Exanthem
 - Onset 2–4 days after fever
 - Erythematous, maculopapular, blanching rash
 - Begins on face → trunk → extremities
- Recovery
 - Cough persists 1–2 weeks
 - Immunity thought to be lifelong

RISK FACTORS

- Measles virus exposure
- Travel to measles-endemic areas
- No prior measles immunization
- Failed measles vaccine response
- Immunocompromised individuals: AIDS, lymphoma/other malignancy, T cell-suppressive medication

COMPLICATIONS

- Secondary infection
- **Diarrhea** (most common)
- **Pneumonia** (most common children's death cause)
- Otitis media (younger individuals)
- **Encephalitis**, acute disseminated encephalomyelitis, **subacute sclerosing panencephalitis**
- Subacute sclerosing panencephalitis

SIGNS & SYMPTOMS

- Prodrome
 - Fever onset, malaise, anorexia, conjunctivitis, coryza, cough
- Koplik's spots on buccal mucosa (1–2 days before rash onset)
 - Red spots on erythematous buccal mucosa
 - Measles pathognomonic
- Maculopapular, blanching, erythematous rash (approx. 14 days after initial infection)
 - Head → trunk → extremities
- Persistent cough after resolution
- Modified measles
 - Measles infection in individual with existing measles immunity
 - Milder symptoms

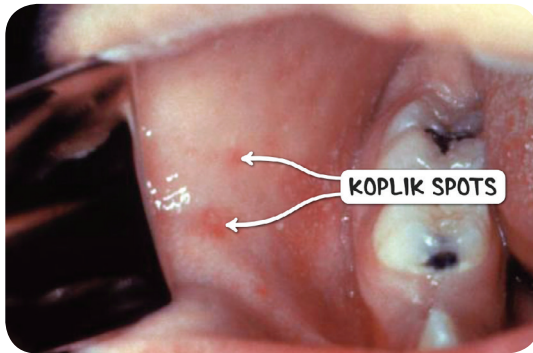


Figure 87.1 Koplik spots on the oral mucosa of an individual infected with the measles virus.

- Atypical measles
 - Measles virus infection in individuals immunized with killed virus vaccine
 - Higher, prolonged fever
 - Dry cough, pleuritic chest pain may present

DIAGNOSIS

- Individual presenting with febrile rash, cough, coryza, conjunctivitis

LAB RESULTS

- Measles detection; one of following
 - **Enzyme-linked immunosorbent assay (ELISA)**: positive measles-specific IgM serology (most common)
 - **Measles IgG antibody**: ↑ (between acute, convalescent titers)
 - **Reverse transcription polymerase chain reaction (PCR)**: measles virus RNA detection
 - **In culture**: Measles virus isolation

TREATMENT

MEDICATIONS

- Antipyretics, bacterial superinfection treatment

OTHER INTERVENTIONS

- Respiratory support, fluids
- **Vitamin A** supplementation
 - Vitamin A deficiency plays role in delayed recovery, complications
- Prevention
 - No specific antiviral therapy
 - MMR (measles, mumps, rubella) vaccine
 - Infection control (airborne transmission precautions for four days after rash onset)

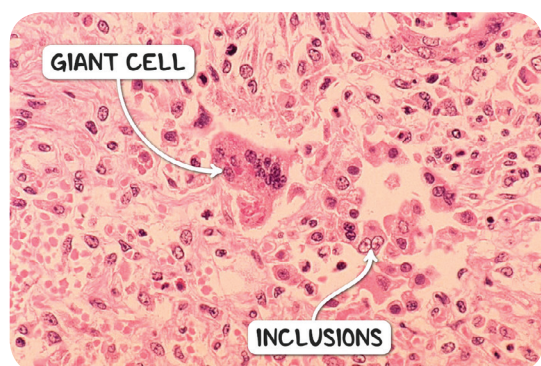


Figure 87.2 The histological appearance of the lungs of an individual with measles pneumonia. There are numerous giant cells, the nuclei of which display inclusions.

MUMPS VIRUS

osms.it/mumps

PATHOLOGY & CAUSES

- Causes mumps; largely preventable by vaccination
 - Fever, headache, malaise, myalgia, anorexia; followed by parotitis
- Transmission
 - Highly contagious
 - Transmission via respiratory droplets, direct contact, contaminated fomites
 - Viral shedding begins before symptoms onset
- Incubation period: 14–18 days
- Outbreaks: schools, military posts, camps, healthcare settings, workplaces
- Replication: occurs in upper respiratory tract epithelium → spread via lymphatics → viremia
- Lifelong post-infection immunity

RISK FACTORS

- Unvaccinated status, international travel, vaccine failure, immunosuppressed individuals, healthcare workers, close-contact

COMPLICATIONS

- Orchitis/oophoritis, meningitis, encephalitis, pancreatitis, myocardial involvement, arthritis, deafness

SIGNS & SYMPTOMS

- Prodrome
 - Fever, malaise, headache, myalgias, anorexia
- Parotitis
 - Swelling, inflammation, tenderness of parotid gland(s)
 - May obscure mandible angle
 - Unilateral/bilateral
 - Usually 48 hours after prodrome onset
 - Commonly children 2–9 years old
 - Stensen duct orifice: may be erythematous, enlarged
- Mastitis

DIAGNOSIS

- Diagnosis suspected in individuals with parotitis/other salivary gland swelling, orchitis/oophoritis with prodrome, mumps virus exposure

LAB RESULTS

- In parotitis setting, diagnosis established by detection of
 - *Mump virus RNA*: reverse-transcription PCR (buccal/oral swab)
 - *Serum mumps IgM* (may not be detectable until 5 days after symptom onset)
- Full blood count
 - Leukocytosis may be seen
- Lumbar puncture indicated in suspected meningitis/encephalitis

TREATMENT

- No specific antiviral therapy

MEDICATIONS

- Analgesics, antipyretics, non-steroidal inflammatory agents (orchitis/oophoritis)

OTHER INTERVENTIONS

- Prevention
 - Measles, mumps, rubella (MMR) vaccine
 - Infection control (isolation with droplet precaution until parotid swelling resolved)



Figure 87.3 Mumps virus causes parotitis, which presents as swelling at the angle of the jaw, widening the facial outline.

RESPIRATORY SYNCYTIAL VIRUS (RSV)

osms.it/respiratory-syncytial-virus

PATHOLOGY & CAUSES

- **Most common cause of bronchiolitis:** viral infection of the lower respiratory tract, blockage of small airways (bronchioles)
 - May also be caused by rhinovirus, influenza virus
- Terminal bronchiolar epithelial cell viral infection → lung epithelial cell damage/destruction → small bronchi/bronchioles inflammation → edema, mucus production, inflammation → small airways/atelectasis obstruction
- **Commonly:** children < two years old
- Often preceded by upper respiratory tract infection symptoms; rhinorrhea, headache, mild fever

RISK FACTORS

- Infants < 12 weeks old, November–May, prematurity, bronchopulmonary dysplasia/ other chronic lung disease history, tobacco smoke exposure, daycare attendance, impaired airway clearance/function (e.g. cystic fibrosis), congenital heart disease, immunodeficiency

COMPLICATIONS

- Bacterial **pneumonia**, apnea, respiratory failure, dehydration, aspiration pneumonia, asthma

SIGNS & SYMPTOMS

- Prodrome
 - Upper respiratory tract infection (rhinitis, fever)
- Cough; tachypnea; expiratory wheeze; ↑ breathing work (nasal flaring, grunting, retractions); crackles heard on auscultation; cyanosis

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray

- If differential diagnosis includes pneumonia

OTHER DIAGNOSTICS

Pulse oximetry

- ↓ oxygen saturation

TREATMENT

MEDICATIONS

- Oral corticosteroids: prior wheeze history

OTHER INTERVENTIONS

- Supplemental oxygen, hydration, mechanical ventilation
 - Respiratory symptoms peak on days 3–5, begin to resolve